WHAT IS CLAIMED IS:

1. An optical disk reader or optical read/write system capable of operating in either a compact disk (CD) or digital versatile disk (DVD) format, comprising:

disk support and drive means capable of supporting and driving either a compact disk having a cover plate of thickness Y or a digital versatile disk having a cover plate of thickness X,

a first laser diode operating with an output beam having a first wavelength,

a second laser diode operating with an output beam having a second wavelength different from said first wavelength,

optical means for either directing the output beam of said first laser diode at a said compact disk when carried by said disk support and drive means or directing the output beam of said second laser diode at a said digital versatile disk when carried by said disk support and drive means, and

a single element objective lens optically positioned between said disk support and drive means on one end and said first and second laser diodes on another end,

said single element objective lens having a central aperture zone and an outer aperture zone, said central aperture zone being profiled to operate at a first numerical aperture (NA) and said output beam of said first laser diode being optically confined to said central aperture zone, and

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said single element objective lens having a central aperture zone and an outer aperture zone, said central aperture zone being profiled to operate at approximately a 0.45 numerical aperture (NA) and said output beam of said first laser diode being optically confined to said central aperture zone, and

said outer aperture zone together with said central aperture zone being profiled to operate at approximately a 0.60 numerical aperture (NA) and wherein said output beam of said second laser diode has ray fans extending across the full aperture of said lens.

7. The apparatus of claim 6 wherein said first surface is located closer to said disk support and drive means than said second surface and further comprising diffractive means carried by said second surface, said diffractive means providing sufficient aspheric surface power for spherical aberration correction and providing correction for spherochromatism.

8. The apparatus of claim 7 wherein said diffractive means provides sufficient correction for spherical aberration and for spherochromatism that said single element objective lens achieves diffraction-limited image quality for both CD and DVD formats.

9. The apparatus of claim 6 wherein said single element objective lens is molded cyclic olefin copolymer or PMMA.

10. The apparatus of claim 5 wherein said diffractive means has a predetermined depth to optimize diffraction efficiency for both laser diode wavelengths.

11. A single element objective lens for use in an optical disk reader or read/write system for either a CD format operating with an approximately 780 nm laser diode or a DVD format operating with an approximately 650 nm laser diode, wherein said single element lens has first and second surfaces and comprises:

a first aspheric surface defined as:

$$sag_1 = \frac{\rho_1 r^2}{1+SQT[1-(1+k_1)\rho_1^2 r^2]} + A_1 r^4 + B_1 r^6 + C_1 r^8 + D_1 r^{10}...$$

and a second surface having an aspheric profile defined as:

$$sag_2 = \frac{\rho_2 r^2}{1+SQT[1-(1+k_2)\rho_2^2 r^2]} + A_2 r^4 + B_2 r^6 + C_2 r^8 + D_2 r^{10}...$$

Where *sag* represents sagittal height and

ρ_1 = 1/radius of first surface vertex
ρ_2 = 1/radius of second surface vertex
k_1 = conic coefficient of first surface ($-3.5 < k_1 < 0.0$)
k_2 = conic coefficient of second surface ($-15.0 < k_2 < -5.0$)

A_1 through D_1 and A_2 through D_2 = general aspheric terms and are non-zero on at least one of said first or second surfaces, and

the vertex curvatures ρ_1 and ρ_2 satisfy $0.667 < \frac{|\rho_1|}{|\rho_2|} < 1.50$

said outer aperture zone together with said central aperture zone being profiled to operate at a second numerical aperture (NA) and wherein said output beam of said second laser diode has ray fans extending across the full aperture of said lens.

2. The apparatus of claim 1 wherein said first surface is located closer to said disk support and drive means than said second surface and further comprising diffractive means carried by said second surface, said diffractive means providing sufficient aspheric surface power for spherical aberration correction and providing correction for spherochromatism.

3. The apparatus of claim 1 wherein said first surface is located closer to said disk support and drive means than said second surface and further comprising diffractive means carried by said first surface, said diffractive means providing sufficient aspheric surface power for spherical aberration correction and providing correction for spherochromatism.

4. The apparatus of claim 2 wherein said diffractive means provides sufficient correction for spherical aberration and for spherochromatism that said single element objective lens achieves diffraction-limited image quality for both CD and DVD formats.

5. The apparatus of claim 1 wherein said single element objective lens is molded cyclic olefin copolymer or PMMA.

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6. An optical disk reader or optical read/write system capable of operating in either a compact disk (CD) or digital versatile disk (DVD) format, comprising:

disk support and drive means capable of supporting and driving either a compact disk having a cover plate of thickness 2X or a digital versatile disk having a cover plate of thickness X,

a first laser diode operating with an output beam wavelength of approximately 780 nm,

a second laser diode operating with an output beam wavelength of approximately 650 nm,

optical means for either directing the output beam of said first laser diode at a said compact disk when carried by said disk support and drive means or directing the output beam of said second laser diode at a said digital versatile disk when carried by said disk support and drive means, and

a single element objective lens optically positioned between said disk support and drive means on one end and said first and second laser diodes on another end, said single element objective lens having first and second surfaces, said first surface having an aspheric profile,

12. A single element objective lens for use in an optical disk reader or read/write system for either a CD format operating with an approximately 780 nm laser diode or a DVD format operating with an approximately 650 nm laser diode, wherein said lens has first and second surfaces and comprises:

a first aspheric surface defined as:

$$sag_1 = \frac{\rho_1 r^2}{1+SQT[1-(1+k_1)\rho_1^2 r^2]} + A_1 r^4 + B_1 r^6 + C_1 r^8 + D_1 r^{10}...$$

Where *sag* represents sagittal height and

ρ_1 = 1/radius of first surface vertex

k_1 = conic coefficient of first surface ($-3.5 < k_1 < 0.0$)

A_1 through D_1 = general aspheric terms and are non-zero on at least one of said first or second surfaces, and

the vertex curvatures ρ_1 and ρ_2 satisfy $0.667 < \frac{|\rho_1|}{|\rho_2|} < 1.50$

a second spherical surface including a diffractive surface with a polynomial phase function having at least the second and fourth power terms non-zero where

$$\text{Phase} = C_2 r^2 + C_4 r^4$$

and = $0.01 < C_2 < 0.05$

and = $0.0005 < C_4 < 0.005$